Eos, Transactions, American Geophysical Union

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Chibabhas City and a poorly desellator velcacio reaks at Carro Jenas Haria 25 km
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SEASAT ALTIMETER DATA

Transactions, American Geophysical Union

Vol. 65 No. 10 March 6, 1984

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SEA HEIGHT VARIABILITY (cm)

CAURRAS AND ASSI-VIOLE TUFFS OF THE MOGOLLON MUSTAINS, NEW HERICO

1. C. Ratto (U.S. Geological Servey, Box 25046, Federal Center, NS 905, Denvar, Colorado 80225), E. T. Marvin, C. V. Neuser, H. Sitherman

The Mogollon Excellate are a major volcegic mource awas to the soothwestern part of the Mogollon-Dentil volcanic Tield, where shout 2000 no finddle-Tertlary volcanic rocks are exposed. The volcenic sequence includes sight major (1000 ms in abs-Tiew told units, which are believed to represent 4 saudinos-related, compositionally-ranad seb-Tiev tuff pairs. The cyclicat sruption, beginning about 34 Hz, of these sinilar, compositionally wound judic from separate, shallow magna charbers suggeste derived ton Troe security magna charbers suggeste derived ton Troe security magna charbers suggeste derived ton Troe security in the Magollen-Det C (leid ware followed 26-13 Mz by inchanantaity besaits volcanic charbers sized mainly by andestite cropy ions. About 27-21 Mz, high-suitee arupted as a bisodal suite roughly coinsident with the beginning of Seels and Range extensional fauditing. Alkali olivina besait flowe as young as 5.5 Mz are insertisyered with hemin-FOI (Gil Conglomerete adjacent to the Mogollon Muncatow. (Calderse, seb-II), teophysic Res., 5, Faper 480151

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8699 VOICABOLOGY CALGERAS OF THE STARRA WADRE OCCIDENTAL VOLCANIC FIELD CHICKUS OF THE SIBRA MADRE OCCIDENTAL VOLCAMIC FIELD MEDITAL MEXICO Eric R. Sesseow iDivision of Earth ead Physical Sciences. Usiversity of Texas # 25ag Antonio, 3se Antonio, Texas. # 25255. Fred K. McGorell Approximately 256,000 km² of vasters Mexico is covered by a volcamic sequence that has as everage this has sent of the second this season and the second secon

NEW RELEASES Geodynamics Senes Voltaint 1 (Lingstryate at Morograph Geodynamics of the Some Volume 26 Western Pacific-

American Geophysical Union

Vol. 65, No. 10, Pages 81-90

Magnetospheric Indonesian Region Currents Alled by T. W. C. Hildo \$38 odiled by T. Polemra \$33

AGU Special Publication Writer Nurroutees Monograph A Streatcar to Sorius Volume 9 Groundwater Subduction Public Transport in San Francisco (1984) I revised [1984] adiled by J. S. Rosanshein \$18. by C. Wahrhaftig and G. D. Bennatt

> Tectonic Map of the Rio Grande Rift and Southeastern Colorado Platasut Naw Mexico, and Arizona by W. S. Baldridge, Y. Bartov and A. Kron \$15

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Ocean Drilling Ship Chosen

Yews

The SalcolBP 471, owned jointly by Sedco. Inc., of Dallas, Tex., and British Percoleum, has been selected as the drill ship for the Ocean Drilling Program (ODP). The contract, with a specified initial term of 4 years with 10 I-year options after that, is expected to be signed by mid March by Texas A&M University, the ODP science operator, and Seden, Iuc. Texas A&M will develop the design for scientific and laboratory spaces aboard the SedeolBP 471 and will oversee the ship conversion. Testing and shakedown of the ship is scheduled for the couning antunus; the liest scientific cruise is scheduled fin next January. One year ago, the commercial drilling mar-

ket sagged, opening up the option for leasing a commercial drill ship (Ens. February 22, 1983, p. 73). Previously, the ship of choice had been the Glomar Explorer; rehabilitating the former CIA salvage ship would have been extremely expensive, however. Built in Halifax, Nova Scotia, in 1978, the

Sedeo/BP ship will provide berths for a crew of 55 and for a scientific crew of 50. By comparisnn, the Glonar Challenger could accom-modate only 45 crew members and 29 scientists (see Table 1). Moreover, the new drill ship will provide roughly 2.5 times the laboratory space that the Challenger had afforded scientists. Although the new drill ship has the capacity for deploying a riser system I with blow-out prevention) in 1,800 m of water, the canability is not expected to be used during the first few years of operation. The Sedco/ BP ship has better weather limits than the Challenger, Philip Rabinowitz, ODP project director and principal scientist, told Eos. Current plans call for early legs of the

drilling program to include studies of the tec-tonics of the eastern Gulf of Mexico; the carbonate sedimentation in the Baltamas; & andy of the opening of the Labrador Sea and its history of glaciation; early cilting processes in the Norwegian Sea: chronology of sediments and the distribution of Saliana dust off merbwes Africa; the development of back-are basins; tectonics of the Hellenic are and the Tyrthenian Sea; and paleoenvironmental studies of the antient Tethyan Sea. Each leg will last approximately 2 months.

ODP will incorporate a new drilling capability, hare-rock spind-to, that will allow scien tists to study active processes of crustal accre-tion in areas of little or no serliment accumu-

March 6, Pc

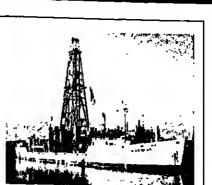
The network averseeing OHP involves many: ODP is supported by the National Science Foundation through its Division of Ocean Sciences, The Joint Oceanographic Institutions, Inc. (JOI), a consortium of 10 major oceanographic institutions, is ODP pro-gram manager. Scientific direction is provid-ed by the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES), an international organization of earth scientists from nations participating in ODP. Drill ship operations will be managed from ODP science operator headquarters at Texas A&M University, where cores from the Pacific and Indian oceans will be kept. (Construction of a new \$5 million building at Texas A&M, to house the core repasitory and the drilling offices, is expected to begin later this year and to be

TABLE 1. Drilling Ship Characteristics

Characteristic	Challenger	SedcolBP 471
Length	122 m	143 m
Beam	20 m	21 m
Operating draft	6.7 m	7.0 m
Operating dis-	9600	16,900
placement	metric	metric
	tons	LOILS
Speed (maxi-	22 kai/	26 kpv/
ກາເາກາ)	hom	hour
Crew canacity	45	55
Scientific crew capacity	20	50
Quarters	74	116
Drill string capacity	7000 m	9100 ca
sation	poor re-	good
Mud/centent systems	linetecl	good
Casing storage	limited	good
Riser and blowood prevention	none	1800 m capacity
capacity	ſair	good
Eligh latitode Capability	good	good .
Laboratory	426 m²	1115 m²
Installed power	77.00 kW	14,700 kW

Ocean Drilling Program.

tion on the Glowar Challenger could be as most likely represent an early evolutionary good as any according to Melvin Peterson, step in the formation of planets. DSDP program manager.



The Sedco/BP 471; selected as the new drill ship for the Decan Drilling Program, is expected to be ready for its first scientific cruise in January 1985.

completed 2 years later.) Lanoun-Doherty Geological Observatory of Columbia University will be a repository for entes from the Atlamic and Antarctic oceans and Iron the Meditetranean and Caribbeau seas. Lamont Doherry also will plan for and manage wireline logging operations.

In addition in U.S. support, several nations have either joined as full participants or as cambidate members. A memorandum of understanding for participation as a full toenber in ODP was signed in reremonies on March 5 by the Federal Republic of Germauy. The FRG is the first country to join ODP as a regular member. The European Science Foundation (ESF), a consortium that includes Italy, the Netherlands, Sweden, and Switzerland, signed on as a candidate member at the same ceremony last week. ESF joins Lamada and the United Kingdom as candidate memhers; each will participate in the planning of drilling activities.

William J. Merrell, Jr., associate dean of

Arctic Hurricanes

The devastating winter storms that stroop across the Arctb, endangering offshore oil rige, shipping, and fishing operations in their paths, are the subject of current study by a team of weather researchers from the National Oceanic and Atmospheric Administration (NOAA) As part of the study, U.S. scientists and those front several other countries also will attempt to estimate how much carbon diaxide ictransferred from the atmosphere into the North Atlantic's deep waters shiring

A typical polar bow, like a hurricane, has a spiral cloud pattern and winds exceeding 120 km per hour, said Melvyn Shapiro, senior mereocologist on the polar-low study. The storms are smaller than most lutricanes, however, and rarely have a diameter greater than 320 km. Some, but not all, develop an "eye," like a hurricane. Polar lows, only recently documented from pular orbiting satellife imagery, appear to form primarily from Detolier to April, but peak in February. "These arctic hurricanes can develop very

rapidly," Shapiro said. In a matter of hours the harticanes can produce winds as high as 160 km per hour, causing "rery high sea states that are extremely dangerous to ship ping in the area, as well as to any offshore oil

activities," he added.

The CO2 investigation may give scientists additional information on possible global warming from increased CO; the ocean is believed to be a sink for nearly half of the CO2 injected into the atmosphere by the burning of fossil fuels. However, little is known about the uptake of CO2 in regions of the North Atlantic, according to NOAA's

Richard Gammon. Researcher's also will study Icelandic lows, which play a major role in extracting heat from the Gulf Stream. In addition, the scientists will exaudine electrical properties, condoct surface prubling of the Greendand ice cup, perform meteorological and oceanographic studies along the polnrice edge, to luvestigate the ice edge's possible link to the outbreak of cold air masses.

New Solar Systems?

A tenm of astronomers from UCLA, Cor-nell University, and the University of Hawaii have discovered what may be two dew plane tary systems aborning around young stars in the constellations Taucus and Monuceros. The team's ground-lased infrared observa-tions of HL Tau and R Mon reveal features ostalled power 77.00 kW 14.700 kW similar to those seen around Vega and Find purce: Program manager for the Deep Sea nomical Satellite (IRAS)—disks of very fine Ocean Delling Project and project director for the dust particles extending outward from a central star. If current theories about solar sys-With new equipment, the heave compensation formation are correct; then those disks

Ushig the technique of speckle interferom-

etry to counter the effects of annospheric dis-tortion, Steven Beckwith of Cornell, Benjamin Zuckerman of UCLA, Melvin Dyck of the University of Flawaii, and Cornell graduate student Michael Skrutskie were able to make the observations using relescones on Manna Kea in Hawaii and Kitt Peak in Arizoua. What they saw in both cases was shortwavelength infrared starlight being scattered by dust particles surrounding the star. In the case of HL Tau, the dusty "cloud" appears to extend not about 160 Astronomical Units from the star (4 times as wide as our solar system) in the east-west direction, but only half that far in the north-south direction. The explanation, according to Beckwith, is that "we're looking at a tilted disk rather than an oblate spheroid." The cloud, in other words, is neither exactly edge-on nor lace-on

as seen Ironi earth. The disk surrounding R Mon is 4 times larger than the one around HL Tau, but is otherwise similar. Both are most likely composed of silicate dust, with the individual particles only a few thousandths of a millimeter across. Both stars are also very young-a mere littioutit years old in the case of 111. Tau, much younger than either Vega or Fo-

These observations, when plugged into the pries of planetary formation, suggest that the swarms of material surrounding HL. Fan and R Mon have not yet coalesced into the planetesimals that eventually become planets. Soyoung is the 111. Tan system, in fact, that radiation pressure from the star would only just have begun to sween these small thust particles away from the center of the disk. From their observations, the astronomers also inter the presence of hydrogen and helium gas around the two stars, comparable in rotal mass to that of our own giant gas planers. And even though the total amount of dust directly observed by the ream only adds up to one earth mass in the case of III. Tan and live earth masses for R Mon. Beckwith believes that this is a rouservative estimate of the total amount of material in the systems, because "we're probably only seeing the edge of the shell."

All of this adds up to the nevest tentance entries in what may eventually become a catalog of other solar systems in the galaxy in different dages of reolution from our own.-- 1R

Changes in Earth **Programs at NSF**

Three programs within the Earth Sciences Division of the National Science Foundation (NSF) have changed names to more accurately reflect the programs supported by them. according to James F. Hays, division director. In addition, the division has two new programs: continental lithosphere and instrumentation and facilities.

The seismology and deep earth structure program is now the seismology program; the environmental geosciences program will now be called the surficial processes program. The scope of these two programs has not been

Volcanology and mantle genchemistry, for-merly the mantle geochemistry program, has been expanded in include all aspects of vulcanological research. Previously, volcanology proposals were considered in various pengrains within the division.

The continental lithusphere program, pro posed as a separate program in the fiscal 1985 budget (£0s, February 14, 1984, p. 19), will support multidisciplinary, multi-institu-tional research projects, including COCORP (Consortium for Continental Reflection Profiling), a global digital seismic array, seismic studies of continental erust, and continental drilling. Within the earth sciences community there is a growing interest in developing such larger cooperative programs, Hays told Ear.
Recent reports by the National Research Council's Board on Earth Sciences and by the earth sciences briefing panel within the National Academy of Sciences' Committee na Science, Engineering, and Public Policy confirm this consensus (Em. December 20, 1983, je, 1851, Havs added.

The establishment of a new program called instrumentation and facilities humalizes elforts in the past 2 years to direct more frinding to instrumentation, Hays said. The progrant will support development of new and prosed instruments and the jurchase of equipment such as electron microscones. nagretonieters, X ray diffractometers, computers, and mass spectrameters.

Annual target dates for proposal submissions are aunounced in the NSF Bulletin. Compliance with the target dates may reduce the interval between submission to NSF and the making of lutiding decisions. However, proposals will be accepted at any time. Instructions for preparation of proposils are included in "Grants har Scientific and Engimeeting Research," (NSF 83-57). Project descriptions should not exceed 15 single-spaced typewritten pages (the equivalent of 30 doneble-spaced pages is acceptable! -- BTR

Young Faculty Awards

Of the 200 science and engineering faculty members who have been selected to receive the first Presidential Young Investigator Awards, roughly one dozen are researchers in genthysics or geophysics-related fields. The awards, which are for up to \$100,000 per year for 5 years (a combination of federal and matching private hands) for each recipi-em, are intended to help universities attract and retain outstanding young Ph.D.'s who neight otherwise pursue careers musicle aca-

More than half of the 200 awards for fiscal 1985 went to engineers. The selection of the 200 was made from 1549 nontinations from 232 Ph.D.-granting institutions. The new investigators will conduct research at 74 universities in 35 states. The program is administered by the National Science Foundation

President Reagan has proposed that 44tt awards be given in liscal 1985; 200 to continue support for those just selected and 200 in apport a new group of recipients

The annual base grant from NSF is \$25,000. In addition, NSF will provide up to \$37,000 per year to match contributions from industrial ources. Individual aniversities are responsible for raising the nonfederal funds.

Among the award reripients are Robert W. Clayton, California Institute of Technology; global seismobigy.

A Bordon Epislic, University of Alabama, Huntsville: solar astronomy.

Michael H. Engel, University of Oklahoma. Numan; organic geochemistrs.

Raymond Jeanky, University of California,

Berkeley; high pressure geophysics. Joseph L. Kirschvink, Calibornia Institute of Technology; paleomagnetism and geobio-

Roman Krzysztolowicz, University of Virginia, water resources engineering.

Daniel R. Lymb, Dartmonth College, water resources engineering. Larry J. Roll, University of Michigan, Ann

Arbor: caribijnake seismology. Jery R. Stedinger, Cornell University: by

iltology and water resonnes. Duane E. Stevens, Colorado State Universi-(v) dynamics of earth's atmosphere.

E. Bruce Watson, Rensselaer Polytechnic Institute: experimental geothemistry.—BIR

Geophysicists

Hugh Odishaw, 67, clied on March 4. An AGU Fellow, he joined AGU in 1954 as a member of the Solar-Planeary Relationships section. The former executive director of the U.S. National Committee for the International Deophysical Year was a professor of geophysics at the University of Arizona in Tuc-

Recent Ph.D.'s

Emperiodically lists information on recenife ac cepted du toral dissertations in the disciplinet of geoplisies. Faculty members are invited to orbini the following information, on institution letterhead, above the signature of the faculty advisor or depart-

the dissertation dife. J2(author's name.

(3) name of the degree-granting department and

If possible include the corrent address and telehone number of the degree recipient (this infor-

mation will not be published). the others listed, are available from University Micodilus International, Desertation Conjes, P.O. Box 1764, Ann Arbor, Mt 48f04.

(3) month and year degree was awarded

Effect of Subwil Structure on the Movement of Two Non-Volatile Oceanic Pollulants (Nitrobenzene, Trichlorobenzene), Lawrence J. Henderson, Oklahomia State Unic., 1983 [GAN83-25816].

Evaluation of Energency Water Supplies as Drought Management Alternatives, Benedykt Dzieglelewski, Southern Illimis Univ., Carbondale, 1983 (GAX89-26327). Flow Strengths of Quartz Aggregates, Carbon and

Oxygen Diffusion in Calcile, Andreas K. Stronenberg, Brown Unly., 1983 (GAX83-25997). Geochemical Evolution of the Inversely Zoned Notch Peak Gravitic Stock, Utak, Peter I, Nube lck, State Univ. of New York, Stony Brook, 1983

(CAXH3-25928). Geochemistry of Orca Barin Sediments, Der-Duck Sheu, Texas A&M Univ., 1983 (GAX83-93716) Groundwater Flow in the Cristalline Rocks of the Acres Plains of Ghane, West Africa, Kohina Aubrah, Princeton Univ., 1983 (FAX83-23878). Inversion of Body-Wave Seismograms for Upper

Mantle Structure, jeffrey W. Given, California

News (cont. on p. 98)

News (cont. from p. 97)

Institute of Technology, 1984 (GAX83-25740). Investigation of Turbulent Scatter From the Mesothere as Observed by Coherest-Smiles Rudar, Kenneth P. Gibbs, Univ. of Illinois, Urbana-Champaign, 1983 (GAX83-24557). Mathematical Analysis of Disteibution Curves in High-litade Metamorphic Carbonates — A New Approach to Time in Metamorphism, Thomas

(GAX83-22698). Metamorphom and Copper Moneralization of the Portuge Lake Lava Nevice, Northern Michigan, Alexander Livnar, Univ. of Michigan, 1983 (GAX88-24232).

D. Coskien, Univ. of Kentucky, 1983

Microgravingtry and the Theory, Measurement and Application of Gravity Gradient, Hwain R. Butler, Texas A&M Univ., 1983 (GAX83-23/i51).

Paleomognetic Stadies in the Nurthern Appulachians and Their Implications for the Paleozoic History of the Orogen, Danti J. Spariosn, Dept. of Geological Sciences, Lahombia Univ., November 1983.

Petrology and Geochemistry of Okmok and Wran-gell Volomoes, Alaska, John Christopher, Univ. of California, Santa Cenz, 1983 (GAX83-23785).

Photovedox Properties of Ivon in Natural Waters,

T. David Waite, Dept. of Civii Engineering.

Physiological-Chinatological Model to Predict Texas Rich l'ields, Vira Phonosombat, Texas A&M Univ., 1983 (GAX83-23702). Relationships of Rock Cleavage Fabrics to Incre-

mental and Accumulated Strain in a Portion of the Blue Ridge, Viginin, James S. Tapp, Unis, of Oklahoma, 1983 (GAX83-24895). Response of a Small Lake to Atmospheric Forcing Droing Fall Gooling, Paul T. Strub, Univ. of

California, Davis, 1983 (GAX83-26108). Rick Assessment for Water Quality Management. Heather D. Wicke, Univ. of Michigan, 1983 7GA X83-245040.

Statistical-Dynamical Study of the Large-Scale Intraceasural Variability of the Northern Hemi-sphere Winter Circulation, Siegtried D. Schu-hert, Univ. of Wisconsin-Madison, 1983 (GA X85-

Structural and Geochemical Evolution of a Mineralized Volianic Vent at Cerro De Pruco, Peru, Ralph D. Rogers, Univ. of Arizona, 1983 [GAX83-23747].

Structure of Turbuleut Entraining Flow in an Annulus With a Rotating Screen, Soun-Chang Vooo, Oregon State Univ., 1983 (GAX83-20437).

Studies on the Generation, Dispersal and Deposition of Tephra in the Marine and Terrestrial

Environment, Steven N. Carey, Univ. of Rhode MIT, [February 1984].

Island, 1983 (GAX83-26172). Theoretical and Empirical Terrestrial Heat Flow Studies (Mexico), John P. Ziagos, Southern Mediodisi Univ., 1983 (GA X83-20072). Theoretical Studies of Mesoscale Eddies and Their Influence on Acoustic Transmission Through the Ocean, Samuel Hzikowitz, Reusselaer Polytechnic lustitute, 1983 (GAX83-21195).

Forum

her of parallel sessions.

Fall Meeting Site

The world is death a very nonliked

nlace. Many problems contributing to this

trouble, such as climatic changes, effects

al' global war, geophysical disasters, etc.,

are the concern and come maler the pu-

view of members of AGU. Within this

Meeting that the matter uppermost in

most members minds was the large man-

In light of the overwhelming autoo-

tame ascribed to this issue, I have devoted

considerable throught as to how to solve

this overcrowding. Putting aside line the

moment the issue of whether or not the

recent Cathedral Hill Hotel lire was a sign

from on high in this matter, I wish to pur

sue what we, as a Union, ran do to solve

Meetings Committee had already appar-

ently perceived the nature of the solution

(although dinily) and had stumbled upon

a form of my result in a different comext.

It is perhaps worthwhile for me to review

this previous situation prior to presenting

my ideas for the West Loast meeting.

The annual Spring Meeting used to

as the Fall Meeting has now. Everyone

the Washington area, and the sealood

(harring Real Tide) was rather good. Re-

sult: The Spring Meeting grew by leaps

and hounds, sessions were overcrowded.

time allounems for presentations shrank,

sion became the order of the day.

and, eventually, the dreaded parallel ses-

At this point the uncarmy instincts and

running intuition that characterize Meet-

into play. Possibly more by lack than any-

thing else they laheringly concluded that

the meeting site should be moved. And-

behold!—the growth rate of the Spring

Meeting became manageadde. Without

there ever being a clear emmiciation of

their underlying principle, the Committee

has noved nametheless even further to-

ings Committee members' minds came

have an alarmingly large growth rate, just

seemed to enjoy going to Washington, the meeting typically occupied 5 at the 10

nice days of weather available each year in

the problem. Remarkably enough, the

context, it was clear at the last AGU Fall

Thermal Tides in the Atompsphere of Venus, Ju-dith B. Pechmann, California Institute of Technology, 1983 (GAX83-21031).

Thorium-230-Uranum-238 Disequilibrium Systematics in Young Volcanic Rocks (Hawaii, California, Price Edward Island), Sally Newman, Univ. of California, San Diego, 1983 (GAX83-19134).

Three Dimensional Ray-Tracing and Ray-Inversian in Layered Media (1), Inverse Scattering and Curved Ray Tomography With Applications to Seismology (2), John A. Fawcen, California Institute of Technology, 1983 (GAX83-25731).

Vacuum Ultraviolet Photogragmentation of Water and Nitrogen Dioxide: Laboratory Studies and Atmospheric Applications, Jan-Bai Nee, Univ. of Michigan, 1983 (GAX83-24253).

Wave Propagation in Purous Rock and Models for Crustal Structure, Terry D. Jones, Stanford Univ., 1983 (GAX83-20729).

Books

Mineral Deposits and Global Tectonic Settings

A. H. G. Mitchell and M. S. Gacson, Academic, New York, xvii + 405 pp., 1981, \$48.50.

Reviewed by Robin Brett

"The couth dues not conceal metals in her depths because the does not wish that men thould dig them ont, but because provident and cagneious Nation has appointed for outh thing its place" Agricula (De Re Metallica, 1556, translated by H. C. Husser and L. H. Hoover, London, Mining Magazine, 1912).

This book aims to show how ore deprisits are related to the concept of plate tectonics; it surceeds. Not too long ago, opaque reinerals in a thirt section were called "uce" by petrologists and then ignored, and ore deposits were freaks of nature which tended to be where you found them. Today, "ore" and ore deposits have become part of mainstream geologic studies—apaque minerals can tescal much about the evolution of a rock, and mineral deposits can reveal tectunic settings.

The main value of this book to most AGU members is that it shows how ore depusits can reveal tecturity setting; aurbiguously in many cases, to be sure, but a pattern is emerging. Mitchell and Garson du nut stress the Hip side, the application of plate tectonirs to exploration, although applications are apparent, and a short chapter is devoted to this

The authors emphasize that ores are rocks that are part of a stratigeaphic or igneous sequence and that, just as andesites are anticipated in sume tectonic settings and not in othees, so are certain types of ore deposits. Mitchell and Garson, whose publications indicate that they are equally at home in the areas of tectonirs and mineral depusiu, discuss the plan of the book in their preface:

In the first chapter we discuss briefly why tectunic settings ore a majur control on the nature of the minerals depusited in economic concentrations, and review the pre-plate concepts of the relationship of mineralization to gensenrlinal settings. We then introduce the plate tectonir lo pothesis, and indicate the major developments in ide is on the relationship of mineral deposition in plate processes. The next six chap-ters, comprising the bulk of the book, are



concerned with the brief description of each of the major types of tectoric settings tecognizable today followed by an account of the main kinds of comomic deposit frumol in modern settings and inferred ancient equivalents. We concentrate on aspecis of the deposits' genesis related to the regional tectonic setting, and no attempt is made in ceriew features such as temperature of formation ur mineralugy which can be found in textbroks concerned exclusively with mineralization and use bodies.

The authors divide tectonic settings into six categories; each category is in turn further subdivided into seven groups. The six major categories are (11 hot spots, ribs, and autocogens; 12) passive cuntinental margins and interiot basins; (3) oceanic settings tridges, basins, transforms, and hot sputs); (4) subduc-tion-related settings; (5) collision-related settings; and (6) transform faults and lineaments in outlineutal crust.

The authors conclude by tracing the evolution of mineral deposits through an orogenic cycle and then devote a bye-page chapter to tectonic settings as a guide to exploration. The book has an abundance of ligures reprinted from the literature and 36 pages of references (published by 1981) that are invaluable, especially because readers interested in plate tectunics are not generally lamiliar with the literature of one deposits.

The authors are both ambitious and cuurageous in attempting to synthesize knowledge of this subject, and their attempt is an unqualified success. Summaries of examples uf lepusits in different tectonic settings are lelt with many unanswered questions that provoked considerable thought—a sign of a good scientific book. Why are certain elements concentrated in certain settings, and why are apparently similar deposits from different settings really similar? Answers to these and othquestions will appear in time and will make ore deposits a more powerful tool for

Mitchell and Garson wisely avoid tectonic interpretation of Archean ore deposits. As tectonic interpretation of ore deposits becomes more sophisticated, Archean ore deposits may becume a useful took for interprelation of Archean tectouism. Therefore this book is especially recontmended to students of the Archean.

The authors have kept an open mind; most interpretations from the literature are presented without question. As a result, many readers will question some uf the work suntmarized in many sections of the book. The authurs' philosophy was clearly to offer comvarie interpretations. An example is their reporting a theory for the origin of fluorite deposits in western North America that alleged that the deposits were formed along a more or less continuous system of rifts and lineaments from Mexico to Alaska by fluorine from the luwer criss or upper mantle. Other theories are also presented without question, yet the authors do question the widely accept-

ed impact ungin of Sudbuty, Ontorio. You may not find your favorite ure depusit mentioned because of space limitations, but Mitchell and Garson dld a fine jub with the space available. Southeast Asian deposits receive special attention because of the authors' own expetience, so the book has the additional advantage of providing an entry to the literature of these deposits not well known to

Western Hemisphere readers. Traditionally, scientific reviewers comment on typographical errors to prove that they read the book thoroughly. I found none; one reference out of place was the only mistake I

I recommend this well-written book to stu- Foreword R. A. Price dents of both plate tectonics and ore deposits. Preface R. Van der Voo

example, since it was written, teports have geoning field.

Reston, 1'A 22092.

AGU New Books

Plate Reconstruction From Paleozoi Paleomagnetism

Geodynamics Series, val. 12, edited by R. Van der Vuo, C. R. Scotese, and N. Bonhommet, AGU, Washington, D.C., viii + 186 pp., black-and-white illustrations, 1984, ISBN 0-87590-512-9, AGU members \$14, others

The decade of the 1970's saw increasing time, fostered by the Gendynamics Project. sphere Program; in particular, Working new interpretations of previous results as well

as new results for Paleozoic time. The editors believe that the contents of this volume represent a state-of-the-art acrount of Paleozoic palenmagnetic studies as they are being carried out today. In this collection of papers the typical successes and failures of modern paleomagnetic research are represented in accounts of remagnetizations or the lack thereof, as well as some examples where the evidence is not yet clear. All authors have emphasized the geodynamic implirations of their results, as well as continental reconstructions based on the latest evidence. Geographically, the papers are representative of the Atlantic-bordering continents, albeit with a

This volume is based on selected papers presented in a special symposium cosponsored by Working Group 2 and the American Geophysical Union and held in Philadelphia

With this first interim report, Wurking Group 2 is starting a decade of international collaboration aimed at enhancing our knowledge about Phanerozoic plate mulions, contlnental configurations, and mountain-building episodes. Future repuits are planned on such lunics as the structure of the Hercyman and Appalachian mountain belts, the circum-Paurogenic belts and the evolution of the Pacific Ocean, and the evolution of the Medlterranean and the Tethys-bordering continents, each based on symposia organized by the Working Group.

(From the preface by R. Van der Voo.)

Although it is expensive, undergraduates and researchets alike will kenefit from it.

Robin Brett is with the U.S. Geological Survey.

global evidence leading to the reconstruction of the confinents and oceanic plates through Aspects of this project are being continued under the auspires of the International Lithu-Group 2 of the program (Phanemzoic place motions and progenesis) is artise in the unraveling of past continental distributions and the plate recionir products of continental mutiuns. Paleomagnetic techniques are especially useful fur the determination of continental reconstructions, and this volume presents a number of papers dealing with syntheses and

heavy emphasis on North American paleo-

during the 1982 Spring Meeting of the American Geophysical Union.

Already the book is a little out of date. For appeared on the Guyamas Basin sulfides and the recent Kuroko study, both with their inportant tectonic implications. That is not the authors' fault, but rather the sign of a hur-

ward the ultimate Solotion (and funder rom the East Gast) by holding the next pring Alecting in Lincinuali. What does all this mean? What has this

o do with the Fall Meeting? Well, of ourse, the above facts suggest a solution which has everything. It is simple, elegant, draconian. People like Sarc Francisco as a meeting place, so my proposal is: Let us rave the inceding sire. For the more timid and take-it-easy among us I might suggest that the Meetings Lammittee consider what I like to call "Baftimore West," i.e., Bakerstield. (My recommendation of this site has nothing—I repeat, nothing—to do with my name being similar to that of the city's humber.) If the Meetings Committee really wants to hite the bullet on this thing then I suggest that the West Chast Meeting he moved immediately to Barstow or, my favorite, Needles, I can assure you that by following this plan, the problem of parallel sessions will be reduced rapidly to i point of zero measure.

H. N. Baker Las Alamor National Laboratory Las Alamas, NAI 875-15

An Introduction to This Valoure: Paleozoic Paleumagnetism and the Assembly of

Pangen C. R. Scolese Paleomagnetic Reevaluation of Pangea Reconstructions R Van der Von, J. Peinado.

The Tethys Paradux in Plate Tectonics J. On the Tectonic Evolution of Mexico: Paleo-

magnetic Constraints J. Urmia-Fucugau-Paleomagnetism of the Middle Mississippia Greenbrier Group in West Virginia, USA

D.-S. L. Chen and V. A. Schmidt Paleomagnetic Results From the Carboniferous of Nova Scotia G. R. Scotese, R. Van der Voo, R. E. Johnson, and P. S. Giles. Late Paleozoic Motions of the Meguma Terrane, Novo Scolia: New Paleoningne

Evidence D. J. Spariosu, D. V. Kent, and J. D. Keppie Paleomagnetism of Lover-Middle Devoniah ond Upper Proterozoic-Cambrian(?) Rocks From Mejeria | Mauritaoia, West Africa) D. V. Kent, O. Dia, and J. M. A.

Songy Mid-Ordovician Paleomagnetism and the Proto-Atlande Ocean in Ireland E. R.

leomagnetism of the Cambrian Rocks of the Great Valley of East Central Pennsylv vania; Fold Test Constraints on the Age of Magnetization R. J. Stead and K. P. Ko

Was Laurentia Part of an Eocambrian Super conduent? R. Van der Voo. C. McCabe, and C. R. Scolese

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The successful applicant for the first of the positions will be expected to devote a substantial part of his or her research to problems in solar or interplanetary physics. This position can be filled as early as Spring 1984 and applications should be received by April 30, 1984.

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ceived by April 30, 1984.

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Inquiries and applications should be addressed to Professor J.R. Jokipii or Professor E.H. Levy, Department of Planetary Stiences, University of Attrona, Tucson, AZ 85721.

Applicants should send a resume, complete hibliography, and arrange for at least three leners of reconsinendation from persons who are well-acquainted with the applicant's background and potential in research.

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> American Geophysical Union 2000 Florida Avenue, N.W. Washington, DC 20009

Cover. Suggested continent positions in Eocambrian (Vendian-Tommorlan) and Late Carboniferous (Westphalian-Steffanian) depicting the assembly of Patigea by the end of the Paleozoic. Shown are figures 1 and 9 from C. R. Scotese's introduction to Plate Reconstruction From Paleozoic Paleomagnetism, edited by R. Van der Yoo, C. R. Scotese, and N. Bonhommet, the latest volume in AGU's Geodynomics So nes, described on p. 98, and 103.

University of Kentucky. The Hepatiment of Geology means applications for two tenare track Laculty positions. Areas of specialization are. 1) Geophysics, 2) Structural or Tectonic geology with some emphasis on geochemistry, geophysics geomathematics or petroleom geology. It is anticipated that holi positions will be filled at the level of Avoisian Professor but applications for a more senior person will be considered, Degree of Ph.H. is repriited.

The Department awards IPS, MS, and Phil degrees. The starting rank and salary depends on qualifications and experience—either industrial or acylemic.

academic.
Lettery of application should invlude a full zoon-aftion vitora statement of intent regarding research, names of three reletters and should be addressed to: Rr. Nicholas Rast, Chartman of Search Committee, Bowman Hall, Room 255, University of Kentucky, Levington, KY 40506-4056, 4000 257-4222.

DEADLINE for application is APRIL 15, 1984.
The University of Kentucky is an alluminist assume and equal opportunity institution.

Research Position in Sparc Plasma and Auroral Physica. Two research positions at the level of assistant or associate research scientists are available in the Department of Physics & Astronomy at the University of Iowa for qualified tandidates with a Ph.D. degree and experience in space plasmas ant/or autoral physics. Present research in space plasma physics emphasizes analysis and interpretation of observations of nagnetospheric plasmas using instrumentation on board earth-orbiting spacecraft in the IMP and ISEE Missions. The University of Iowa's global intaging instrumentation on the spacethe IMP and ISEE Missions. The University of Io-wa's global imaging instrumentation on the space-craft Dynamics Explorer I is the source of an exten-sive data base of auroral images from high abitudes at visible and ultraviolet wavelengths. Photometric observations are also available for other areas of re-search including the physics of the upper atmo-sphere and the global distribution of atmospheric ozone. The applicant should identify and describe areas of his or her expertite which can support ex-perimental or theoretical investigations in space plasma physics and/m auroral physics. Salary and position will be determined by the applicant's quali-lications and experience.

position will be determined by the applicant's qualifications and experience.

A resume and the names of three persons knowledgeable of applicant's experience should be forwarded to: L. A. Frank, Department of Physics & Autonomy, University of Iowa, Van Allen Hall, Iowa Gits, Iowa 52242.

The University of Iowa is an affirmative action/ The University of lows is an affirmative action/

Ocean Turbulonce/Oregon State University. Join us in studying ton bulence in equatorial waters? A positioctoral position is available at Oregon State University in a project entitled "Turbulent Transporty in TROPH: HEAT "The society applicant will assume a major date of the responsibility for deployment of vertical probling "university in the major that probling "university in November 1984 and then will share responsibility for scientific analysis of the data obtained. The starting date is nominally I August 1984, but its somewhat regoriable. Starting salary is \$20,000 yearly. Applicants it university and most be apable of performing independent research on oceans unitablence. Applications must be received by 31 March 1984 by:

Douglas R. Caldwell College of Oceanography Oregon State University Univallis, (4R 97331 Oregon State University is an allimative actions equal opportunity employer and complies with we-tion 501 of the Rehabilitation Act of 1975

Air Force Geophysies Laboratory Geophysics Scholar Program /1984–1985). The Air Force Geophysics Laboratory (AFIL) and The Southeastern Center for Electrical Engineering Education (SCEEE) announce that applications are invited for research appointments during the 1984–1985 year in the Geophysics Scholar Program. This program provides research opportunities of 10 to 12 months duration for selected Engineers and Scientists to perform research in residence at the AFIL. Hanscom AFB, near Boston, Massachusens. Scholars will be selected printatily from such lichts as Geophysics. Attauspheric Physics, Meteorology, for Lhemistry, Applied Science, Mathematical Modeling using Lomputers, and Engineering.

To be cligible, cauchidates must have a Ph.D. or equivalent experience in an appropriate technical field. Some appointments may be confurned prior to August 1984 so early applications are encouraged. All qualified applicants will receive consideration without regard to race, color, religion, sex, or national origin. Application Deadline for September Appointments: August 1, 1984, For further information and application forms contact: SGEEE, 1101 Massachuseus Avenue, St. Cloud, FL 32769 Telephone: (305) 892-6146.

SCEEE supports Equal Opportunity/Affirmative Action.

Marina Geology and Geophyales/Uolveralty of Washington. The School of Occanography is seeking candidates for a position as Research Assistant Professor, but applications at a more senior level will be considered. Preference will be given to a candidate who has research interests in marine geology and geophysics and who will interact with our ongoing research projects, especially in the area of ridge-creat processes. Although this position will eventually be funded through self-generated research grants, partial financial support is available for the first two years. Teaching requirements will be limited and at the graduate level. For consideration, send a resume, a brief letter describing research interests, and four letters of reference by I May 1984 to:

search interests, and four letters of reference by I May 1984 to:
Professor Brian T.R. Lewis Director
School of Oceanography, WB-10 University of Washington Seattle; WA 98195
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University of Rochester/Postdoctoral Position in Low Temperature Geochemistry. The Department of Geological Sciences has a postdoctoral position for research on low-level, naturally occurring radioisotopes [Be-10, Gl-38, 1-129, etc.). The research involves the separation of trace amounts of diese elements with emphasis on the measurement of 1-129 in a variety of materials to evaluate its potential as a tracer for fluid movements. Measurements will be carried out on the University's landern acceleration.

ments will be carried out of the chartery accelerator.

The position is available immediately and is initially for one year with a possible one year extension. Send applications with resume and addresses of three referees to:

Dr. Udo Fehn

Department of Geological Sciences
University of Rochester

Reclinator, NV 14f97.

Rochester, NY 14097.

FACULTY POSITION

Geological Engineering Program Department of Civil and Environmental Engineering

Washington State University

The Geological Englneering Program at Waahington State University has a tanure-track faculty position at the assistant/associate profassor lavel in the srea(a) of geohydrology and/or borehole geophysics. A Ph.D. is required and the ideal candidate will have a background combining both

Geohydrology: A strong background in the geological sciancaa and a high lavel of proficiency in numerical modeling is highly dasirable. Geophysical exploration background is also desirable. Geophyaics: A atrong background in borehole geophysics with interest in geohydrology and evaluation of geotechnical properties of rock is

The successful applicant will teach undargraduate and graduate level courses in geohydrology and/or geophysics and be expected to take over an establahad research program involving graduate students. Profession-

al registration, or qualifications to obtain such registration, is desirable. Qualified opplicants should send o resume, copies of undargraduate and graduata transcripts, and at laast threa letters of recommendation to Dr. Surinder K. Bhagat, Chaliperaon, Department of Civil and Environmental Engineering, Washington State University, Pullmon, Washington 99164-2910 by April 7, 1984. Wnahington State University is no equal opportunity/affirmativa action employer.

Staff Opportunity: Geophysical Laboratory/Curnegle Institution of Washington. Privately-endowed, basic-research and educational organization seeks outstanding scients with broad interest in the veloping the principles of Element Concentration. Applicant's background especially should include experimental experience involving a wide range of pressures and temperatures, theory of mass and leaf transport, and held aspects of one deposits. Familiarity with stable-isotope research desirable. Creative and innovative qualities essential.

Successful applicant will be appointed Earth Sciences Research Scholar for a period not to exceed three years. After demonstration of leadership and excellence in research, the Scholar will be eligible for a regular walf position. Modest lands are available for technical support of the Scholar's work.

Applications now being accepted by the Director, Geophysical Laborators, 2801 Upton Success. N.W., Washington, ICC, 2000s, Sulunia 3-2 page winniary of proposed research program, varticulum vitae, three letters of recommendation from pwesons chosen by applyant, and completed Application Form obtainable from Executive Secretary Starting date is after 1 July 1984 and is negotiable.

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Faculty Poshlon In Meteorology. Applications are invited for a tenure-track or tenured faculty position in the Unision of Meteorology and Physical Oceanography or the Rosenstiel School of Manine and Amosphera Science of the University of Meanif. The rank and salary will be negotiated depend-

Senior Applications Chemist. Keves Corporation is seeking an imbividual with a strong Aradynial Chemisty background, in particular in Neray Fluorescene, for Applications Paborations Three years of experience in Falson Industrial Analytical Problem solving using XRF is required Advanced degree in Physical Science of Engineering is preferred. Position requires Applications support to Marketing, Sales and R&D operations. Solving resume in: Mr. Drew Isaacs, Keecy Corporation. 1101 Chess Drive, Foster City, CA 94404

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ing opon qualifications. The applicant must hold a Ph.D. in annospheric science, or closely related held, and have a thorough knowledge of large-scale atmospheric dynamics. We are especially seeking applications from douse interested in chimate dynamics, including observational studies of all aspects of the general circulation and its interaumonal variability, although qualificed vanidances in other areas are also encouraged in apply. The surcessful candidate will be free to pursue an active research program with a limited amount of graduace-level reaching. Applicants should sulum cuericulum vitae and the names of direc references to: th. Eric J. Pincher, Chairman of Search Committee, Rosenside School of Marine and Atmospheric Science, University of Miami, 4000 Rickenbacker Canseway, Mann, Florida 23149.

SENIOR SCIENTISTS ATMOSPHERIC SCIENCE **METEOROLOGIST**

NASA-Goddard Space Flight Center Laboratory for Atmospheric Sciences Greenbelt, Maryland 20771

NASA/Goddard Space Flight Center, Laboratory for Atmospheric Sciences is now accepting applications for two senior scientist positions to lead scientific research in global weather and climate modeling, predictability studies and related research in the Global Modeling and Simulation Branch, Development and maintenance of collaborative activities with the academic community and other institutions/agencies are also important.

The research program strongly emphasizes use of remotely sensed data in numerical weather prediction, and cooperative efforts with other branches of the Laboratory engaged in atmospheric and climate research. The objectives of research in this branch are to investigate the dynamics of global scale processes including climate and boundary processes on various space and time scales. Activities include theoretical and descriptive studies, modeling and prediction of the atmosphere, data set preparation, future observing system simulation studies, algorithm development and research aimed toward design of new or improved satellite missions. The Branch also has responsibility for leading an "Experimental Climate Forecast Center" recently established under an arrangement with the National Climate Program Office, Providing leadership for this new activity would be a part of the role of one of these two senior positions. There is at present a stnff of ten research personnel headed by Dr. Eugenia Kalnay, in addition to a substantial support staff.

These positions will be at the GS-14-15 level with a salary range between \$42,722 and \$65,327, the present salary ceiling.

Interested applicants should send resumes no later than May 30, 1984 to:

Dr. D. Atlas, Chief Laboratory for Atmospheric Sciences NASA/Goddard Space Flight Center Code 910 Greenbelt, MD 20771.

The U.S. Geological Survey (USGS), Geologic Division, Office of Earthquakes Volcanoes, and Engineering (OEVE) announces a vacancy for Deputy for External Research to act as a senior staff member and consultant to the Chiel, OEVE, in planning of contract and grants programs relating to earthquake hazards reduction research. Duties include managing, reviewing, and coordinating contracts and grants in earthquake research undertaken by OEVE, and maintaining contact with both public and private institutions and agencies conducting related research. Geographic location of this position (Resion, Virginia; Denver, Colorado; Menio Park, California) is subject to negotiation, depending upon selectee's preference and the requirements of management. Position is a GM-15 with initial salary of \$50,252 per annum for new Federal employees. Send Standard form 171 (SF-171), Personal Qualifications Statement, available at any Federal Personnel Office, to:

> Geological Survey ATTN: Mr. R. W. Mervine 215 National Center Resion, Virginia 22092

A detailed resume of education, experience, and salary history may be substituted if an SF-171 is not available. All applicants must submit copies of college transcripts or a first of courses taken. Applications must be received in the USGS Personnel Office by April 13, 1984.

Equal Opportunity Employer.

Staff Poskhon/Department of Terrestislet Magnetism. The Department of Terrestical Magnetism of the Carnegic Institution of Washington invirs applications for a staff position in geor hemistry. Applicants should have a demonstrated ability for active and innovative independent research using trace-element and/or isotopic treatments to investigate the origin and genthemical evolution of the solid earth.

solid earth.
Applicants should send a resource and have three letters of reference forwarded by May 15 to:
Ecoclimistry Stalling Continuities
Department of Terrestrial Magnetism
5211 Broad Branch Rend, N.W.
Washington, DM: 20015
Stasting time for the appointment is flexible though a target date of late 1984 is preferred.
Carregic fusionition of Washington is an equal one-stumby, allumancy action equalsters. opposituuts, allumatise action employer.

Faculty Position/University of Montana. The Fa-ology Department of the Concersity of Montana is inciding applications to lift a temposary, one-year position at the Assistant Professor level Contract prein iting appirations to the a temposary, one-way
position at the Assistant Professor level Contract prerod will be from ind-Seprember 1983 to rail. June
1985. This position involves replacement of a facility
to member on sublantical leave, Ph.D. in geology is
preherred, however, M.A. while teaching of professonal experience oill be consultred. Sindents planung to complete their Doctorate thining dw 1984—
85 a adentify was an electionaged to apply I paching responsibilities include undergradiate courses
and introductory geology, innerdogy, periology
(so fourmary), and a seniori in area of special interest.

Those interested should send a letter of applica-tion, resume, three letters of recommendation to: Arnold J. Silvengan, Chamban, Depastment of Facility, Tracersiv of Montana, Missonia, MT 20812, The DEADLINE for applications is Mar 15, 1981. The University of Montana is not albritanice ac-tion/equal opportunity coupliese.

POSTDOCTORAL APPOINTMENT IN ANALYTICAL. SEPARATION OR RADIOCHEMISTRY

The Isotope Geochemistry group of the Los Alamos National Laboratory is seeking candidates for a postdoctoral appointment in analytical, separation or radiochemistry.

This apportunity will include participation in a solar neutrino experiment [Science 216, 51 (1982)] with involvement in separation and purification of trace quantities of technetium from large quantities of mulybdenite. Experience in wet chemical separation is required.

The Laboratory, one of the nation's foremost scientific research urganizations, is operated by the University of California for the U.S. Department of Energy. Our New Mexico offers an unernweed life style with ample recreational activities. Our postdoctoral appointments are for ane year, renewable far a second year and pay a stipend amount of \$26,200 in \$27,600 per annum. We provide em-ployee benefits, including incoming travel and moving expenses. Candidates no more than three years past their Ph.D. are invited to apply. U.S. Cittzenship is re-

Send your resume in confidence to: Madeline Lucas DIV 84-AT Personnel Services Division Los Alancos National Luboratory Las Alamos, New Mexico 87545



Coastal Dynamicist at Stony Brook. Position with tenute at advanced Associate Professor or beginning full Professor level to be available mid-jamary tall Professor level to be uvaliable mid-january 1985. For a physical occurring appear specializing in contail occur through a strong interest in an algorith and minerical modeling. Must have demonstrated ability in attract research support. Position ratios that support for the arademic pear. Canditates should send resume and the names of three individuals from whom letters of reference may be obtained, to Dr. Bonald W. Prichard, Associate Director for Research, Marine Sciences Research Lenstras, SUNY Stong Brook, Stony Brook, NY 11794. Deadlate for applications is May 1, 1984. SUNY Stong Brook, is an equal opportunite/allirmatice action employer. A K# 47-81B.

The University of Texas of Onlins/Postdoctoral Openings. The Phiversity of Texas at Dallas actionally has positional apenings in the Physics Program, Furrent research areas inclinics XUV fassers and Laser Spectroscopy (E. B. Collins and C. D. Camrelli, Space Plasma Physics (W. B. Hanson and W. J. Heikkilat, Space Opticy III. A. Finsley, Cluster four Studies (A. Fauringham), Solid State Physics (R. Bioner and R. Chancey, Superials ary competitive Interested applicants build send vita findical curiff excellentials for Altitudity Action Statistical parasocs; is reproceed to most research tion Statistical purposes is respected but not required), and names of three references to: Physics Repartment, CT-Halles, P.H. Box 830688, Richardson, T.N. 75083-40688,

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Howard University/Gsuduate Fuculty Position.
The Department of Genlogy/Geography invites applications for a territy track pushion in generalists at rank of Grantvate Associate Professor beginning August 1984. Position in nitros development of graduate reveach program at Master's level, Specialization in enumerated generalists/geochronology/isotope geology dysited. Send letter of application, resume and names of three references to:

Dr. Bayld Schwartzman. Denaturent of Ecology/ Dr. David Schwartzman, Department of Feology/ Geography, Howard University, Washington, DE

Sedimentologist. The Geology Department at Mashington State University animatices at Assistant Professor tenure track position for a field oriented clastic sedimentologist, commencing August Hi, 1984. Applicants will be expected to: 1. Carry on an active research program 2. supervise graduate students at the M.S. and Ph.D. levels

3. reach undergraduate courses and graduate

3. feach undergraduate courses and graduate courses in their specialty.

The Geology Department at WSU is a coung, gsowing Department housed in a number challing with research locillies including a microprobe.

SEM, seedimentology lab, etc. There are nurrently 12 faculty members, 50 rundergraduate majors and 60 graduate students. In addition the Oepartment shares a Geological Engineering program with Cicil and Environmental Engineering program with Cicil and Environmental Engineering.

Chaing date for application is May 17, 1984. Candidates must have the Ph.D. and should have a resume, transcripts and list of fice referees sent to:

G.D. Webster, Chairman

Oepartment of Heology

Department of Beology Washington Stare University Pullman, WA 99164-2812. Washington State University is an equal opportu-ity/allirmative arrion employer.

Planetary Gologist/Geophysicist: Jet Propulsion Laboratory, Earth & Space Sciences Olysion. The Planetary and Deranography Section anticipates the acaitability of one or two fulfillines staff scientist research positions in the areast of planetary geology and geophysics. The rank of appointment is open, but applicant should be based the paudo total level with a demonstrated record of expertise and an emphyshment in independent research and publication. We welcome applicants with interest in structural geology and grophysics as applied in the stink of solublook planets and material suchies with emphasis on eleterationing surface properties and processes on planetary objects (wing ground-base and spacetal remote sensing data and applicable theoretical and experimental recluiques. Applicants double stoned eleter anthony their experience, professional goals, resume, and comes of pertinent publications to 18. William R. Ward, Manager, Planetology and Decanography Section, Jet Propulsion Laboratory, 4800 Cak Grove Drive, Depa. 121, Mail Stone 2014, Pararlena, CA 91109.

Physician. The National Deanic and Almospheric Administration (NOAA) onnounces a Physician GS-13, vacancy in the Environmental Research Laboratories, Spaic Environment Laboratory, Supporting Research Division, Boulder, Colorado, Starting salary of US-13 level in \$36,132; Duties inclinde conducting research on the physics of the solar corona as related to the centission of matter and radiation which result in disturbances in the non-can be environment. Demonstrated achievement in basic astrophysical research is required. For further information and application procedures, please call Mary Plumley, NOAA Personnel of 1303) 497-5102. Applications must be received by March 30, 1984, to be considered.

Faculty Position of Scripps Institution of Oceoning raphy/Institute of Geophysics and Planetary Physics. Applications are invited for a return trank faculty pusition in the broad field of Illuid dynamics. ica. Applications are invited for a tenure track faculty position in the broad firld of third dynamin's which includes, for example, or example, to the order of the dynamics of the carth's core. This appointment, as is the case for all other faculty positions at IGPP, will be made jointly with the leading department of Scripps or another department at the United sity of California, San Dirgo. Qualifications include a Ph.D. in rate of the sciences (including engineering), demonstrated competence in original research (presumably through publication in refereed journals), and in reaching at both the under graduate and graduate level, which includes an appropriate command of both spakent and written English. Qualified applicants at all levels will be considered. Salary with the commensurate with the individual's qualifications. Please send applications and nominations to:

ndividual signameanous, rease seria apparation and noninations to: Professor Freeman Cilbert University of California, San Diego Institute of Geophrsics & Planetary Physics A.095

Insulate of Geophicses & Planetary Physics A-025 La Jolla, CA 92193. Responses must be received by April 20, 1984. The University of California is an altinuative acqual opportunity employer.

Reacarch scientists/University of Colorado. The Laboratory for Atmospheric and Space Physics at the University of Colorado seeks qualified research scientists in the held of numspheric physics. The successful applicantle) would conduct research with the scientific team at LASP analyzing more than two years of Solar Mesosphere Explorer (SME) data. The extensive data base includes global measurements of governmentation, water cannot (SME) data. The extensive data base includes glubal measurements of ozone, temperature, water vapur, nitrogen dioxide and other parameters of the Earth's Mesophere and Stratosphere. A dixtorate or its equivalent in a relevant subject is necessary. The personist selected must be capable of combucting individual research and working as part of a scientific team. A background in solar, planetary or annospheric sciences is desirable. Salary commensurate with experience. A publications including a current professional resume and names of three references should be sent up.

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the KIVAS; contract administration, proposal writing and negotiating with agent less sponsoring research at the KIVAS; teaching, as appropriate, of academic classes in the Eadlege Division. The suscessful candidate should have a Ph.D. or equivalent in physics or electrical engineering. Caudifate needs to be compared in use of clustrous and digital measuring equipment and of computational aids. Should have several cross of professional work experience and he scentifically moderated. Send applications to: New Mexico Tech, Personnel Dilac, Rown Hall, Sorm to, NM 87800.

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Research Assistantalips/University of Masyland, The Meneouslogy Department of the University of

AGU Scholars In recognition of the strong support of the America Geophysical Union and its substantial contribution to the American Geological included as well. Innitute's (AGI) Minority Participation Program, 12 of the 1983-1984 Atil schularship the purpose of the workship and gave some

participants were designated "At IU Scholars Because part of this support comes from a matching grant from the National Oceanic and Annospheric Administration to increase the number of minority students studying in fields related to the development of marine and coastal resources, live of these students were designed "AGU Sea Schulars."

The AGU Scholars, all of whom have elected courses of study related to the broad areas of interest of the Union, are Rulus Latchings, a geophysics grathiate student at Stantord University; Charles R. Elerson, a graduate geophysics student at Louisiana Technical University; Ronald L. Keas and Orlanda M. Marques, undergraduate geophysics students at the Colorado School of Mines; Andrew Lewis Mickle, a hydrology graduate student at the University of Florida; Jaime Rangel, an undergraduate geophysics student at the University of Texas at Austin; and Ronald Wynn Sheers, a graduate geochemistry student at Obio State University.

The AGU Sea Scholars are Amon Ambony Diaz, an undergraduate oceanography sudem at Washington State University: Adam Green, a marine sciences undergraduate surdem at Smithhampton College of Long Isand University; Peter A. Herrera, a genchemistry graduate strulem at the Colorado School of Mines; Michael W. Howell, a matine genehemisty students at the University of Michigan; and Dawn J. Weight, an oreanography graduate student at Texas A&M

Catchings, Howell, and Wright have been AGU Schukare in prim years.









Actions at Hamburg

International Association of Seismology and Physics of the Earth's Interior

Historical Sciamograms

The third Workshop on Historical Seisino-grams, held in Hamburg on August 18–19, 1988, in conjunction with the meeting of the nlernational Union of Geodesy and Geophysics in Hamburg, Federal Republic of

Germany, was specifically organized to discuss the status of historical seismic data for Latin America and Europe. Since it is unlikely that an additional workshop will be held on far more than 500,000 seismograms have this subject, reports for other regions were

Maryland has research assistantships available for graduate sindents, Fall Seniester 1984. The Department offers from ses of sinde leading to the degrees of Master of Science and Doctor of Philosophy in meromologs. Sindents with a bachebot's degree in mereorologs, the physical sciences, mathematics, or engineering are incited to appple.

Sintancel in the Maryland suburbs of Washington, O.E., the University is in an ideal boration for fineration with the large meteorological community of the area. The Department has comperative research agreements with the National Occardo and Arimospheric Administration and the National Aeronaudics and Spare Administration. Acress to bacilities of

In the first session, H. Meyers described

been filmed as part of the Historical Microfilming Project and emphasized the importance of the activities to be covered during the workshop. M. Hashizmure, representing

these and other government agencies, including the large computers at the National Center for Atmospheric Recearch and NASA, are important resources for sundents at Maryland. The Larger after Institute for Churate Kegrarch and the Center for Orean-Land-Atmosphere Interactions, both established recently on campus, offer the student expanded opportunities for advanted souty and research or timeter analysis, modeling and prediction. A large number of private and government agencies within the metropolitan Washington, D.C. area offes employment opportunities.

employment option unities.

Interested individuals are cut ortuge to write for more information to the following address: Chair-

history of the previous activities of the IASPEI/Unesco Working Group on Historical Seismograms. F. R. Engilahl noted that thus having these data available for the analysis of having these data available for the analysis of seismic risks, particularly in areas where the recurrence rate of significant earthquakes is very low and for regions where much data do

man, Department of Meteorology, University of Maryland, College Park, MD 20742.

Resensch Fellowships in the University of Noise Owne. Fellowships in geomedwater physics, groundwater chemistry, anaembar princesses and bittengineering are currently available in the Environmental Engineering Psogram of the Civil Engineering Department. Successful applicants will be awarded animal stipends of up to \$1000/mm, plus full mitim. For additional information, counser Dr. Aaron A. Jennings, Department of Civil Engineering, University of Notre Dame, Notre Dame, 1N 40546 (219-230-5846).

AGU (cont. on p. 102)

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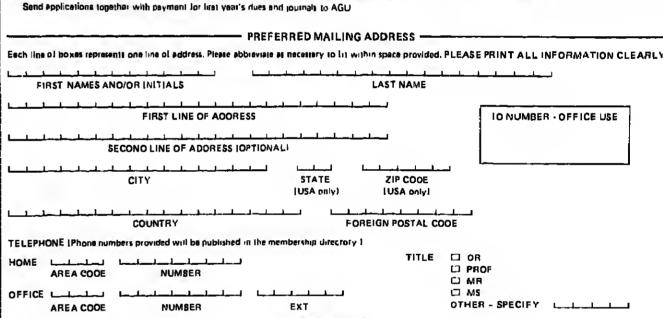
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not exist. He mentioned that buth these conditions occur frequently in developing na-

The second, third, and limith sessions provided an apportunity for the participants to describe the status of historical seismograms in their rountry. Generally, all rountries indicated that there is activity relating to the preservation of historical seismograms and that the level of activity varies from country to country. The importance in preserving original seismograms, whether filmed or not. was stressed. The first task, which appears to have been completed by most countries, is the identification of the older seismic stations and the instrumentation. In some countries, work has not yet been completed in identifying whether the remards still exist or where they are located. For many countries, particularly in Europe, the records have generally been located and in some cases are now extremely well organized. In some cases, filming has been flone, or at least tests in various filming proredures have been statted. Almost all of the reports indirated two serious conditions that prevail: (1) Many of the oldest records, particularly those which are smoked namer. are deteriorating and are in fragile condition. (2) Many records for significant events are missing from tiles of historical seismograms. In past years, these records were loaned to ismakights in other rountries and probably never returned. An appeal was made for the return of seismograms to the station of pri-

During the fifth session, the speakers reflected on some of the experiences gained thus far in the Historical Seismogram Microblining Project. The status of a related project, including a unicrofilm collection of Historical Station Bulletins, was described,

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The last session was devoted to recommen dations. The workshop partiripants made 10 recommendations which were eventually written into four substantial resolutions, incorporating all of the espects of the recommendations. The mitiral aspects of these four resolutions were reconstituted into one major resolution whirh was submitted to IASPE1 and eventually passed as an official IASPEI

Resolutions

1. The Working Group notes and approves the progress in copying and preserving historical seismograms and other seismological doruments of runtifuling importance to research, reaffirms the resolutions of its meeting in Tokyo in 1982, December 20-22, and urges IASPEI and Unesco to continue their valued support, and to consider the following additional resolutions:

2. Reeliging that continued delay in rollecting and copying historical rerords will cestel in further rioration and loss of irreplaceable data, The Working Group recommends (1) that World Data Centers and Regional Commissions compile lists of earthquakes believed to have been large, destructive, or to have occurred in some unusual location. or to possess some other special rarity; [2] that Centro Regional de Sisniologia par America del sur and Pan American Institute of Geography and History escerta)n what records from stations in South and Central America still exist, where they are stoced, and what their physical condition is and recommend at least two stations is the region for immedi are filming of all rerords; (3) that the USSR be asked to extend his existing program of copying to include copying of all records from at least one selerted station: 141 that the European Seismological Commission seleri ai leasi two stations in western and central Encape whose records should be com-pletely copied and in part their selection to their General Assembly in 1984; and [5] that developing countries with long-established stotlons such as thus at Helwan (Egypit and Tambaya (Mexicot be given special encouvagement and assistance to copy their

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3. Realizing that for some studies even the best ropies are infarior to originals, and that document and arrhival material other than instrumental records contain data of importance for seismological research, urges (II that IASPEI and Unesco broaden the scope of the Working Group to consider other historical material, such as catalogs, station bulle-tins, notebooks containing unpublished statetials, instrumental constants, time corrections and the like, and documents describing preinstrumental carthquakes and to assess the desirability and methods available for preserving them; (2) that World Data Centers A and B should publish a comprehed sive list of seismograms that may still be runstilled and should complete the microfilming of its global rollerion of station bulletins; 13) that all observatories retain their original records and store them in the manner best calculated to preserve them and extend their useful life; and (4) that participating nations make their hulding of historical material

available to World Data Centers for copying.

4. Converted at the number of records of im portant earthquakes missing from auriving likes of historiral seismograms, urges that observatories and individual seismologists holding recursls borrowed from other stations, or copies of missing originals. endeavor to return them to the most appropriate organization in their country of origin critical de-

Recognizing the importance of historical seismograms to the study of seismirity, earthquake risk, and the mechanism of carthquakes, partirularly large carthquakes or smaller shorks in regions of infrequent activity and in developing rountries where few records are available are concerned, commende the progress of the IASPEDUnesco Working Group on Historical Seismograms in lorating and copying historical material, and in securing the safety and preservation of endangered originals, and orgen die sociation jointly with Unesco to continue and extend their support of the aims of the group as set out in its detailed veconimendations, giving particular consideration to those that concern the preserva-tion of originals, the immediate copying of the rec-ords of partirular stations and earthquakes, the documentation of the present location and com-pleteness of the files of stations no longer in opera-tion, and the return of borrowed records to their rountry of origin.

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Applications for membership have been received from the following individuals. The letter after the name denotes the proposed primary section affiliation.

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gen (H), Sieven R. Wilds (), Amir Yeganeh-Haeri (T), W. T. Ivan Yeung (GP), Carol G. Young (V), Elizabeth A, Zbinden (V).

Meetinas

Announcements

United Kingdom Geophysical Assembly

April 9-1), 1984 Eighth United King-don Geophysical Assembly, Newrastle upon Tyne, UK. (UKGAH, Department of Genphysics and Planetary Physics, School of Physics. The University, Newcastle upon Tyne. NEI 7RU.)

Papers and research exhibits will cover all fields of geophysics, ranging from local and regional studies to the study of the entire earth. Among the specific topics to be discursed are exploration geophysics, earth-quake and explosion seismology, paleomagnetism, geomagnetism, geor bronology, geophysical instrumentation, planetaty physics, and the teaching of geophysics. There will also be a keynote lecture each day of the assembly and a meeting of representatives of geophysirs tearbing departments on Wednes-day, April 11. In addition, a meeting of the Joint Assoriation for Geophysics will be held an April 10.

Geoscience Instrumentation

April 19-20, 1984 Geoscience Instrumentation Workshop, Argonne, III. Sponsors, Argonne National Laboratory and the University of Chicago. [Don Rote, Argonne National Laboratory, 9700 S. Cass Ave., Avgenne, IL 60439; tel. 312-972-3786. Comurt before March 30.)

The workshop will focus on the vature of the instrument crisis in the geosciences, spe-ofic instrument and training needs, and pos-sible solutions. Participants should be lamiliar with needs for geophysical/georhenical laboratory and held instrumentation. The workshop will last 2 full days, and will consist of plenary and working group meetings; a re-pon will be published afterward. Limited funds are available for travel.

Meeting Report

Magnetospheric Plasma

The aim of the Chapman Conference on Waves in Magnerospheric Plasmas, February 7-11, 1983, in Hawaii was to bring trigether investigators of magnetospheric plasma waves having frequencies from VLF reliaters and emissions down through ELF and ULF to Pc5 long period pulsations. The emphasis was on the physics and techniques underlying the en-tire frequency range. Topics solirited included ponlinear electron and ion cyrloron wave growth; wave-wave interactions, such as VLF-Pel (0.2-5 Hr), VLF-VLF, and various ULF-VLF; wave-partirle interactions; free-energy sources for waves; harmonic generation; the role of heavy ions in ware generation and propagation; artificial wave generation such as Siple transmissions, electrojet modulation, and power line radiation; and wave and spectrum analysis terhuiques.

It is impossible to consider all ropics presented, and this brief report concentrates on the ronmon properties and interactions between ULF and VLF. A large lody of papers deah with the cyclotron instability. With the aid of realistic rumpmer simulations, theoretical studies of the electron evelopin mechanism which is responsible for VLF emissions established that many of the simplifying assumptions necessary in the past could be relaxed and that the instability is quite dependent on the inhomogeneity of the magnetospheric plasma. There are still a mumber of questions to be answered to bring the thenretical, simulation, and experimental results rogether. The physics of the proton evelotron instability giving rise to Pel pulsations has not been developed to the same extent as the eleriton case, probably because of the difficulties associated with undertaking accurate spectral measurements. Rather, the emphasis in this area was on thermal heavy ions (He'. tt1) and associated evilotion absorption and

propagation effects in the magnetosphere of the Earth and the to plasma forms of Jupiter.

There are important interartions among electron cyclotron whistler-mode, ion cyclotron, and low frequency hydromagnetic warrs. It is studies such as these that provide the veasons why scientists from the two ends of the spectrum should interact. The intensity and frequency of birth cyclotron modes are strongly and similarly afferted by magnetospheric compression and expansium. Quasi-periodic ELFAVLF emissions are probably carried by modulation of the whistler-morle generation source by Pc3-4 standing hydromagnetic waves. During subatorm develop-ment, dawnside VLF chorus and duskside IPDP pulsations appear practically simultaneonaly. This illustrates the importance of wave-particle interartions. Other areas of interest involving wave-partirle interactions inrluded the theory of particles in Pc3-5 compressional waves, upstream waves near the bow shock, vortices in the boundary layer plasma, and VLF chorns and Landau reso-

ments are now beginning to provide extreme-ly important and detailed results on magnetospherir properties. For example, early shunte election gun results report the generation of polatized and unpolarized electromagnetic noise while the electron beam experiment on GEDS 2 has been used to detect the electric helds of waves with frequencies up to 50 Hz. Other papers were concerned with power line radiation in the magnetosphere, VLF wave injection experiments and associated particle precipitation, and waves associated with modulated HF heating of the polar electrojet ionosphere at frequencies from several kHz does to the Pc5 range. Another group of papers addressed the topic of waves generated un auroral field lines. Electrostatic waves were invoked to explain processes associated with pulsaring among and narrow-band emissions in a diffuse aurora. Consideration of parallel electric fields and field-aligned critreuts and the formation of ion conins was discossed using simulation techniques and analytical theory. It was suggested the pullowing hydrogen and oxygen ions may be an celerated by ion evolution wave heating.

Active wave and particle injertion experi-

The nongram was arranged so that there would be no parallel sessions and with the conviction that all papers presented should interest all attendees. There were 104 papers presented in the morning and evening sessions by the 76 partiripants and contributions were equally divided between oral and poster

The session enried with a rritique of the meeting. All felt the balance between posters and oral presentations (56/50) was just about right. A new approach was adopted for the presentation of poster papers. Prior to early poster session two previewers shared a 45minute oral presentation which provided alcout a 5-minute squarage of the main. points of each paster paper. The previewers were given at least 2 days for preparation so that they could disruss the papers with authors, obtain key figures, and prepare their preview. This proved most successful auri was generally considered preferable to requesting ndividual authors to attempt short presentations of their own work. This view was shared the ambors, many of whom considered this preview-plus-poster method preferable to the ronventional oral method for some pa-pers. In contrast, only 1% of papers submitted indicated a preference for conventional poster presentation. The decision to have morning and evening sessions, learing the afternoons free for discussion, was well re-

There was divided upinion on the timing of the next conference, if any, and the possible sites. In the meantime there will be a wave session at the COSPAR meeting at Grazn June 1984, and three half-day sessions on UEF/VEF waves in umgnetospheric plasmas at the URS1 General Assembly in Florence in September 1984, Twenty-four of the papers from the Hawaii meeting were published in the August 1983 issue of Geophysical Research Letters under the guest editorship of W. J. Hughes,

This meeting arbort was contributed by R. L. Dowden, who is with the Physics Department, University of Otago, Danielen, New Zeoland, and B. . Fraser, who is outh the Physics Department, University of Newcastle, N.S.W., 2308, Australia.

Separates

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Oceanography

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University, indiffex, New Scotia Bill All Canada and lake, tabbell.

I specimens conducted on the Orsean continental shell in June 1979 indicate that the boundary layer flow at the sea floor was hydrodynamically smooth. Fine-remoted the seaf floor was hydrodynamically smooth. Fine-remoted and the late profiles a universally-namitar, mentrally-bowant flow ever a smooth wall. The namidiam glong thinkness of the vineous sublayer is for more workable than ion been observed in laboratory studies note perfectly smooth walls. This workability may conceivably be related to upstress changes of our four frughness, or to the presence of distributed roughness, or to the presence of distributed roughness changes, and suggests that flee near the most dead of low adjuncts what for the results indicate that the next lead of the distributed and the sublayer in the occan may be influenced by roughness changes, and suggests that flee near the sublayer, logarithmic layer. ublayer, logortthwic Layert . Geophys. Ros., C. Paper 400127

4790 Oceanography | Instruments and Techniques|
THEGRY AND VALIDATION OF THE MULTIPLY MINDON SEA
SURFACE TEMPERATURE TECHNIQUE
t. M. MCHILLIA | Notional Environmental Saislille, Data,
and information Service, National Oceanic and Abnospheric Administration, Vashington, D.C. 2023], and
P. S. Crosby
The development of the "split window" eppreach for
correcting saislite measurement of redisnos for atmospheric actemustion is reviewed. Then the theoretical
results are compared to results from schwal measurements which consist of astallite measurements in the
three infrared windows of the AVHRR, Ground truth for
The comparisons comes from bours. The satellite
measurements were acressed for clouds and the remaining
ones were used in the enalysis. Wising this date Set,
several statistical enalysis were performed. These
shound that when the two chaemels which are truly a
split window are used, the result of the statistical
model agrees with the eas darived from theoratical
considerations. When the 1.8 m channel is combined
with one in the 10-12 m region, the result of the considerations. When the state of the state

Water Resources Research

Volume 20 Number 3 Merch 1984

Stephen J. Burges Water Resources Research: The Tweetleth Year (Paper 4W0240) idelines for Improved Institutional Analysis in Wester Resources Planning | |Paper 3W1866) Some Baset Schulens for Bolute Transport Through Soils Contelling Large Cylindrical Macropares (Paper 3W1838)

M. T. van Genuchten; D. H. Tang, and R. Guenatelo,
M. T. van Genuchten; D. H. Tang, and R. Guenatelo, M. T. van Genechtes, D. II. sang, and
Patrick Tell
Numerical Integration of Stochastic Offercaled Equedions in Catchment Modeling (Paper 3W177), T. E. Unay
An Advection-Diffusion Concept for Solute Transport in Heisrogeneous Unconsolidated Geological
Deposits (Paper 3W1772)

Stochastic Streamflow Models for Hydroelectric Systems (Paper 3W966)

M. V. F. Preiren, O. G. Oliveira, C. C. G. Costa, and J. Kelman
All seconds.

M. V. F. Pereira, G. G. Oliveira, C. C. G. Cotta, and J. Resemble A Lagrangian Porous Media Mesa Transport Model [Paper IW1837]

N. R. Thomson, J. F. Syker, and W. C. Lennox
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Comment on "Stochastic Modeling of Mess Transport in a Random Velocity Field" by O. H. Tang, F. W. Schwartz,
C. S. Simmons C. S. Slaminas P. W. Schwarit wid L. Smith

Correction to "Ae Estimpte of the Costs of Liming to Nautralize Acidic Adipoidack Surface Waters" [Paper 3W 713]
Friedric C. Merd and Charles T. Driscoll Correction to "Aquifor Thornus Budgey Storage: A Well Doublet Experiment at Ingressed
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